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The Harveian Oration on Medicine in the Century before Harvey.

Mr. President, Fellows, Ladies and Gentlemen,— In obeying the command of your predecessor to deliver the Harveian Oration, I desire, Sir, to record my deep sense of the great honour bestowed upon me, and of the diffidence I experience in approaching a task that has occupied the abilities of so many distinguished men in the past. Already two hundred and two orators have complied with the conditions formulated in Harvey's bequest. The subject has been presented from many aspects, and I should be guilty of an act of presumption were I to suppose that any part of the field had escaped the minute investigation of so many acute intellects.

Harvey, when founding this oration, indicated with great precision its aims and its extent, but the provisions elaborated with such care by the founder have been interpreted by successive orators in various ways. Sometimes the orator has obeyed the injunctions of Harvey more or less literally, while at other times a brief reference to the commands of the founder has sufficed to link them to the subject of the oration. But Harvey desired this oration to be, above all, the medium of an annual exhortation to this College for the express purpose of keeping alive in the minds of the Fellows certain important principles for the guidance of their conduct in private and professional life

—principles as worthy of acceptance to-day as they were in the seventeenth century. For this reason I am constrained to call attention to the commands contained in Harvey's bequest, for they form the essence of the creed of all honourable physicians whether ancient or modern.

These commands of Harvey may be considered for a moment with reference to the manner in which they have been modified to meet the needs of modern times. The founder ordained that this oration should be delivered in Latin, but that tongue has not been heard on this occasion since 1864. The Latin language has ceased to be the usual method of communication between the learned, and by common consent that injunction has been allowed to fall into abeyance. The second injunction imposes upon the orator the duty of mentioning by name all the benefactors of the College, of recounting the work they have accomplished, and of exhorting others to emulate them. But here again the lapse of years has swelled the roll of those who have benefited the College to such an extent that the time at the disposal of the orator would hardly permit him to comply with the command. A judicious selection of names, therefore, is all that the orator can attempt in obedience to this act of piety demanded by the founder. The two remaining injunctions, requiring us "to search and study out the secrets of Nature by experiment, and also for the honour of the profession to continue in mutual love and affection," present no difficulty to the orator of the twentieth century, for they comprise the whole duty of the physician in every age in which his life is passed. But when Harvey in 1656 attached to his bequest these two fundamental commands the peculiar condition of political and scientific thought rendered them specially imperative. The experimental method in science was then in its infancy, and many physicians still clung obstinately to the teaching sanctioned through centuries by authority, itself based on insecure foundations. Political and religious feeling ran high in the seventeenth century, and the admonition "to continue in mutual love and affection"

became the solemn duty of every man who had the welfare of the College near to his heart. Although no direct evidence exists in support of the contention, it is impossible to believe that some echo of the fierce political and religious passions then raging in England was not heard within the walls of the College. For the College contained in its body men ready to die for the king, and men just as ready to send that king to a shameful death; men to whom the surplice was an abomination, and men who sighed for the days of universal orthodoxy, before King Henry VIII had raised his destroying hand. All honour, then, to this College for the restraint it was able to exercise, so that, while Puritan and Royalist were engaged in a deadly struggle, the Fellows, holding the same divergent opinions, were able to meet and conduct their business with such decorum that history has been unable to record any overt act of enmity. The amount of control needed may be imagined when men like John Bathurst and Laurence Wright, both in Cromwell's service and high in his favour, took their seats at the Comitia side by side with Harvey and Sir Charles Scarburgh, who were no less zealous in the service of their king. May such moderation be an example for all time!

This College, since its foundation in 1518, may be regarded as representative of medical thought in this country, for, with few exceptions, those who have contributed to the advance of the science and art of medicine have been members of its body. But of all those who have conferred honour and distinction upon the College by reason of their additions to our stock of scientific knowledge, William Harvey occupies alone the place of honour. His great work, in which he gave for the first time the true explanation of the manner in which the blood circulated, was published to the world in 1628—one hundred and ten years after the foundation of the College. The appearance of that work marked the beginning of the epoch of modern physiology, and

the close of the long period during which the authority of Galen had held undisputed sway. After the publication of the *De Motu Cordis* the scales fell from the eyes, and men broke for ever with the old and inept tradition that had for centuries hindered the advance in scientific thought concerning biology. But however far-reaching the influence of Harvey's great work may have been, it must not be forgotten that it was but one of the epoch-making movements taking place at the same time in other branches of science. For the early years of the seventeenth century witnessed the gathering of the first-fruits from that vast change produced largely by the revival of learning—a change which ended mediævalism and freed the human mind from the fetters of blind adherence to authority.

In my attempt to comply with the conditions laid down in the bequest of Harvey, I propose to direct your attention to a consideration of the history of medicine and science during the first hundred years of the existence of this College, or up to the date of the appearance of Harvey's work. In carrying out that project it will be my duty to indicate briefly the chief causes responsible for the decay of learning during the Middle Ages and the revival of letters in the fifteenth century ; for the re-birth of the study of medicine and science I hold to be a part of that wonderful change. I shall then pass to a review of the state of medical and scientific knowledge during the sixteenth century, or up to the appearance of Harvey's work in 1628. Finally, I shall offer some considerations concerning the change wrought in medical and scientific thought during the seventeenth century by the advent of Harvey. In adopting this method I shall be able to select from the roll of the College types of mental activity in illustration of the various phases through which medical thought passed during the period under review.

The Age of Authority.

Until the dawn of the sixteenth century, coeval with the foundation of this College in 1518, it might be asserted that the study of medicine had made little advance in Europe since the Greek period, which closed with the age of Galen. For more than a thousand years, therefore, the world was content with a medical system constructed in ancient times. But it was not medicine and science alone that failed to register any advance, for the study of all branches of learning was involved in the same black night o stagnation and obscurity, and as age succeeded age Europe receded farther and farther into the abyss of ignorance and intellectual sloth. The chief cause for this lamentable state of learning in Europe was political, and really began on the day when Constantine the Great, in 323, spear in hand, followed the invisible heavenly guide in marking out the limits of the city of Constantinople, the future capital of the East. Although the great founder fondly hoped to rule both East and West while established on the fair promontory at the entrance of the Bosphorus, it soon became evident that the two empires must separate and accomplish their destinies in their own appointed ways. By the time that the great Theodosius was carried to his grave in 395 the division of the empires, begun in 364, was complete, and the Greek influence was confined to territories along the shores of the Bosphorus, the Propontis, and the Eastern Mediterranean, with stately Constantinople as its diadem. As time proceeded, Greek thought, learning, and language became more and more circumscribed within the ever-narrowing limits of the Eastern empire, and the little progress their influence made was entirely in the direction of the east and south. Meanwhile the Western empire in Europe steadily discarded the Greek influence until scarcely any vestige of it remained. To all but a few the Greek tongue in Europe was unknown. Barbarians occupied the throne of the Cæsars, and a crude system of theology prescribed the

limits of knowledge, beyond which the minds of men were forbidden to venture. From time to time half-hearted attempts were made to revive Greek thought in the West, but the result was transient, and the dark cloud of ignorance and indifference settled down once more.

Yet it must not be supposed that all learning was dead. The classics were still read in the West, but the knowledge they contained was closely guarded by the religious houses, and was the appanage of their inmates alone. The Church soon became aware that its power, both spiritual and temporal, required support that could be obtained only by an appeal to the intellect. In response to this demand, in the eleventh century was laid the first foundation of that system of learning known by the name of "Scholasticism" which has amazed and, perhaps, appalled the intellectual world ever since. In support of the tenets of the Church the aid of metaphysics borrowed from Aristotle was invoked, and a system was reared having for its basis certain principles founded upon the authority of antiquity which it was sacrilege to impugn. For centuries intellectual Europe was engaged in the barren task of commenting upon these principles. They could not be submitted to destructive criticism, for to doubt or to inquire entailed pains and penalties in this world and in the world to come.

The Revival of Learning.

But although Western Europe was unacquainted with the Greek tongue at this time, it was nevertheless possessed of a knowledge of the writings of the Greeks by means of translations into Latin through the medium of Arabian and Syrian translations from the original Greek texts. Through the same tortuous channels the medical writings of the Greeks were brought to mediæval Europe, were appropriated by the "schoolmen," and were subjected to the empty and narrow methods of the commentators. Meanwhile the Eastern empire was slowly dwindling, and ts limits were gradually becoming confined to a small

area with Constantinople as its centre. But, as Philelphus has said, in that peerless city the Court and the Church still spoke the language of Aristophanes and Euripides, and the libraries were still stored with the priceless manuscripts of the learning of ancient Greece. Although the Greek tongue was lost to Europe, and although the Eastern empire was becoming every year a more and more circumscribed civilization, two events were about to take place which may be regarded as first steps towards the restoration of the Greek spirit in the West. I refer to the Crusades and the occupation of Constantinople by the Franks for a period of nearly sixty years. From the fervent pages of Anna Comnena we are made acquainted with the astonishment of the first Crusaders when, with predatory eye, they beheld for the first time the Greek capital in all its luxury and glory. We know also how frightful was the spoliation to which that fair city was subjected by the Franks when, in the name of the Master which both contending parties served, they marched through blood to its capture. It is, however, impossible to suppose that the visits of the Crusaders and the occupation of the city by the Franks did not contribute to the diffusion of the Greek spirit in the West.

The final act which unlocked the treasures of Constantinople and gave to Europe a full knowledge of Greek learning came in 1453, when on that fateful 29th of May Mahomet the conqueror burst through the gate of St. Romanus over the corpse of the valiant Constantine, and the Greek Empire ceased to exist after a thousand years of mingled glory and shame. Christendom has rightly deplored the last act of that tragedy when the Crescent supplanted the Cross at Constantinople. But the historian records with satisfaction that out of the evil thus perpetrated untold good came to Europe. With the final overthrow of the Eastern empire the treasures of Greek learning were released, and became quickly disseminated throughout Europe. The Greek scholars fled and took up their abode in Italy. Ships coming

from the Golden Horn carried the priceless manuscripts which the Turk, caring nothing for the learning of the infidel, had spurned. Italy received with kindness the scholar-refugee and his literature. The vanguard of those who were destined to restore the Greek spirit to Europe had already settled in that country, and soon the Italian universities were busily engaged in imbuing themselves with the new influence. Thither flocked students from every part of Europe, and among them one revered by this College, Thomas Linacre, our great founder. Scholasticism was swallowed up in the advancing tide of humanism; learning revived, and with it medicine and science began to be studied again in a manner calculated to produce solid and lasting results.

Now if acquaintance with the condition of medical knowledge previous to the revival of learning be desired no better book can be consulted than the *History of Physick* written at the beginning of the eighteenth century by that admirable and learned Fellow of this College, Dr. John Freind. This work was composed in 1723, while Freind was lodged in the Tower under political suspicion, and does the greatest credit to his scholarship and vast knowledge of the medical writings of the ancients. In point of style the work is excellent, and although the first book to appear in this country dealing with the history of medicine, successive historians have been able to add little to our stock of knowledge of the subject. Freind's lively wit and the mastery of an easy style enabled him to present the history of medicine in a garb most acceptable to the reader. In a delightful vein of sarcastic pleasantry, worthy of his friend Swift in his happiest mood, he deals with the pretensions of many so-called medical authorities during the Middle Ages. From a study, then, of the pages of this Father of the History of Medicine in this country a clear view of the state of medical knowledge in the Middle Ages may be obtained, and Freind is fully worthy of being commemorated this day as a benefactor of the College, as a man of letters and as a physician.

The condition of medical and scientific knowledge in the Middle Ages, as described by Freind, may be summed up in a few words. With the intellectual stagnation existing at that period in every branch of thought, progress could not be expected. Whatever mental energy was expended had for its aim the foundation of immutable principles that time and the ingenuity of the intellect could never alter. The learned might explain, but they might not criticize. Whatever had received the sanction of authority became a fixed belief, and steps were taken to protect it from doubt and destructive criticism. In fact, the ultimate end of all intellectual effort during the period of the Middle Ages was teleological, and so long as that spirit remained dominant no real advance in any branch of learning could be possible. All the knowledge that the Middle Ages possessed concerning medicine and science came from the Greeks, and even this was presented in an incomplete and inexact form. Through translation and repeated copying numberless errors had found their way into the classics, and it became a matter of no little difficulty to correct and purge them. How manifold were these errors will be understood when it is remembered that Hermolaus Barbarus restored no less than two thousand corrupt passages in the thirty-six books of Pliny. The Middle Ages, previous to the revival of learning, represented, therefore, a stationary period in which, as Whewell has justly observed, learned men could be produced, but not discoverers.

But with the revival of learning in the fifteenth century came a far-reaching change in the attitude of students towards the study of medicine and science. Hitherto they had been content to accept what had been sanctioned by authority. They were not competent to determine whether the texts they read were exact translations from the original or merely corrupt compilations by ignorant scribes. The recovery of the Greek tongue transferred medicine from men of this class to physicians

deeply versed in classical knowledge, who combined the study of humanism with that of medicine and science. Their examination of the Greek texts enabled them to detect the violence that the translators had committed in their corrupt translations. These humanist or scholar-physicians loomed large in the first half of the sixteenth century, and it has been the desire of some to treat their work with scant respect. But let us remember that without their aid it would have been impossible to revert to the original Greek texts, that they threw off the yoke of the Arabian translations and enabled students to go with safety to the Greek fountain-head of medical knowledge.

Many of the scholar-physicians had acquired their knowledge of Greek in Italy, where the study of that language had reached a high degree of perfection. But of all those who made a pilgrimage to the shrines of the new learning in Italy, the great figure of Thomas Linacre, the founder of this College, and the best example of the scholar-physician, possesses for us an absorbing interest. It will not be necessary for me to recount the main facts of his career, and indeed to do so in this college, his ancestral home, would be an act of impertinence. But I may with propriety comment upon certain features of his life and activities in order to assess the enormous debt this country owes to his learning, and to his efforts to improve the condition of medicine. Already proficient in the Greek language, through the influence of his friend and master, Selling, he travelled to Italy for the purpose of placing himself under the best teachers of the classics. Arrived there, he sat at the feet of Politian, to whom he owed his exquisite taste in Latin composition, and of Chalcondylas, who refined his knowledge of Greek. But while engaged in the pursuits of classical knowledge his thoughts became directed to the study of medicine, and after a residence of a few months at Padua he graduated in medicine at that university. Linacre had spent two years only in Italy, and some have pointed to this short

preparation as evidence that the exercises for the degree were merely perfunctory. But in those days a knowledge of medicine as taught by the ancient writers was all that was demanded for the degree of doctor, and Linacre, we may be sure, while studying Greek and Latin, had become fully conversant with the medical texts, so that he could perform with ease the exercises required.

The writings of Galen appear to have attracted him most, for in after-years he confined his attention to that author, and devoted his unrivalled scholarship to the purpose of providing correct and elegant Latin translations of his more important works. The success of these translations was great, and largely owing to their popularity the authority of Galen became paramount during the early part of the sixteenth century. Indeed, so sacred was the teaching of Galen during part of the century that John Geynes, a Fellow of this College, was fined and threatened with expulsion for daring to impugn his authority. These translations of Linacre showed a distinct advance when compared with similar writings during the middle ages. They were not commentatorial, but merely good and exact translations from the original Greek, and enabled students of medicine, probably for the first time, to read Galen untrammelled by the useless and prolix commentaries of inexact and mediocre translators. After a perusal of these correct translations came the inevitable scientific sequence of doubt and inquiry.

But to Linacre belongs a glory far in excess of any he obtained as a scholarly translator. Even the solid basis on which his fame rests as the first to revive letters in this country must yield to the position he occupies in our hearts as the great founder of this College—the first institution devoted to the conservation and advance of medicine in this realm. He had visited Italy, then the only place where the influence of the revival of learning was felt. In the various universities where he had pursued his studies, and where he had consorted with men of learning, he was impressed with the manner in which

facilities were afforded for the prosecution of the quest for knowledge in all its branches. Padua, then nearing the zenith of its influence, must have had a profound effect upon his mind. No doubt he compared these busy centres of learning with Oxford and Cambridge, still slumbering in the heavy and uninspiring atmosphere of sterile scholasticism. In Italy he felt intellectual life vibrating, and saw men striving to climb the heights unfolded by the revival of learning. In England he remembered only the droning of the commentators, the unprofitable exercises, and the thunders of the nominalists and realists. While preparing for his degree in medicine at Padua he had seen the attention paid to that subject. The care bestowed upon the study of medicine by the universities and the State in Italy sank deep in his mind, and when in after-years he resolved to improve the condition of physic in his own country it was after the Italian model that he shaped his College of Physicians. England had her universities devoted to learning, and now, through the inspiration of Thomas Linacre, she was to have her College of Physicians specially designed to guard the interests of physicians and to promote the study of medicine.

The Scholar-Physicians.

To Linacre, the scholar-physician, then, we owe it, and to him alone, that England soon after the revival of learning possessed a college endowed with adequate powers to guide and direct medical progress. The influence of that corporation upon the medical destinies in this country has been great. Throughout the course of centuries the College has retained the characteristics, indelibly impressed by the founder, of high purpose and catholicity of aim. For these reasons we of this College honour this day Thomas Linacre as the founder of our College of Physicians.

But the influence of Linacre bore fruit in other direc-

tions. With his friends Grocyn and William Latimer he was responsible for the introduction of the revival of letters in this country. Without that revival the scientific achievements of the seventeenth century could scarcely have been accomplished. Finally, towards the end of his life he designed a scheme for the promotion of the study of medicine in the sister universities, and although the practical application of that scheme fell far short of the intention of the founder, the credit for the idea belongs to Linacre. Indeed, it would appear that in these latter days the desire of Linacre to improve the facilities for the study of medicine in the universities is at last meeting with its reward. At Oxford the funds of the Linacre lectureships are now devoted to the teaching of physiology, while at Cambridge you, Sir, as the occupant of Linacre's chair, have been worthily entrusted with the pious duty of promoting the aims so earnestly desired by the founder.

Less than half a century had elapsed since the death of Linacre before the destinies of the College were placed in the able hands of another scholar-physician, John Caius, a worthy successor of the founder. But for his energy and perseverance it is probable that the influence of the College as a factor in medical progress would have been confined within narrow limits. Caius, like Linacre, was a scholar. He had trodden the same path in his quest for learning in Italy. Taking the founder as his model, he spent his life in promoting the cause of learning and medicine. His benefactions were conspicuous, and whether he was designing the regulations of the College which bears his name, or ruling over this institution as its President, his aim was ever the advancement of knowledge. Although a true type of the scholar-physician, he was the first in this country to write a treatise on clinical medicine, and his short work on the sweating sickness is the precursor of the work of Sydenham and Heberden. Natural history also claimed his attention, and with Edward Wotton, a Fellow of this college, he shares the

honour of being one of the first to write on that subject in this country. Of the thoroughness of his work for the promotion of the interests of this College we have abundant evidence in the first volume of the *Annals*, written in his own hand. To the most minute detail he ordered everything, from the compilation of the first book of Statutes to the provision of the silver caduceus still in use, and his pious act in rescuing from neglect the tomb of the founder. In common with Linacre, Caius was strongly attracted to the writings of Galen, and spent much of his time when in Italy in making a careful examination of the manuscripts of that author. But his scholarship, although profound, was not cast in such a rigid mould as that of Linacre, and there is evidence that his mind was undergoing the emancipation inevitable with the ever-widening scope of learning taking place in his day. When in Italy he lodged with Vesalius, and from this association it is probable that he acquired his taste for anatomy. In after-years, when he refounded Gonville Hall, the study of anatomy received full recognition in the regulations of the College. He also lectured on anatomy before the Barber-Surgeons, and may thus be regarded as the founder of the study of anatomy in this country. For this and his unselfish devotion to the interests of the college, we record our thanks this day.

Caius may be regarded as the last conspicuous example of the scholar-physicians, and it will not be out of place to attempt an estimate of the work they accomplished in the cause of medical progress. These men were deeply versed in all the learning of the age in which they lived, and their knowledge of medicine came to them in the ordinary course of their studies. They were scholars first, and sometimes their interest in medicine was inconsiderable. This attitude will, however, occasion no surprise when it is remembered that the knowledge of medicine in those days was stationary, and did not, therefore, oblige the student to keep himself informed concerning its progress. So long as he knew the ancient medical authors

and the commentaries thereon, his knowledge could never be out of date. But when the revival of learning began to influence Europe the stationary period of medical and scientific knowledge soon showed signs of passing away, and it became no longer possible for the scholar to keep up with the advances that were being made. For the revival of learning had let loose upon the world experimental science, and scholarship alone was incompetent to deal with the problems that arose. For these reasons, therefore, soon after the middle of the sixteenth century, science, including medicine, became divorced from scholarship, and a new race of men arose who dared defy written authority, and who inquired only of Nature for the revelation of her secrets. In this way was prepared the road for the great scientific advances which took place in the seventeenth century, one of which was the appearance of Harvey's great work.

The scholar-physicians, then, of whom Linacre and Caius were such shining examples, in spite of their limitations, occupied no inglorious position in the history of medical and scientific advance. They effectually bridged the period between the end of the influence of the Middle Ages and the beginning of sound scientific methods. Their knowledge, it is true, was sought in the study, but their scholarship was invaluable to the medical age in which they flourished. They restored the pure texts of the medical classics, and thus enabled those engaged in the study of medicine and science to begin anew their investigations. The scholar-physicians were also deeply imbued with the higher aims of humanism. From this spirit sprang their desire to benefit mankind, which took definite shape in the foundation in this country of institutions designed to promote the study of medicine and science. In the early years of this College the Roll contained the names of many whose attainments in scholarship far outweighed their ability as physicians. Besides Linacre and Caius may be mentioned John Clement, Edward Wotton, and Richard Bartlot. These

men created that spirit of wide culture in the college which remains to the present day. To the scholar-physicians, therefore, we render thanks, and especially must we hold in remembrance the work of Linacre and Caius in the foundation of this College and of Caius College at Cambridge.

Progress in the Sciences.

Attention must now be devoted to the history of the progress made in the sciences, after the ground had been prepared by the revival of learning. Soon after the beginning of the sixteenth century a reconsideration was undertaken of the data on which the sciences were based, and produced a change in the conceptions hitherto regarded as fixed. The first movement in the direction of progress came from the domain of astronomy, when Copernicus, discarding the Greek system, adopted the heliocentric theory. But his epoch-making work did not see light until 1543, although completed many years before, and its full fruition was postponed until Kepler formulated the laws governing the eclipses towards the end of the century. Botany also began to advance. This subject had remained in a stationary condition, and had been satisfied by the compilation of herbals in which the teaching of the ancients was alone regarded. The first to break away from ancient tradition was Leonicenus, who impugned the authority of Pliny ; and he was followed by Fuchs, Gesner, and Caesalpinus, all of whom drew their facts from a study of Nature rather than from books previously compiled.

Towards the end of the sixteenth century the science of physics was recast and placed upon a sound basis. Stevinus had established the principles of the inclined plane, William Gilbert, a distinguished president of this college, had disclosed the properties of the magnet, and Kepler had supplied the deficiencies of Copernicus, thus supplanting for ever the ancient astronomical system of

Ptolemy. The laws of moving bodies were soon to be formulated by Galileo, and physics freed from its errors was in a position to lend its aid to the other sciences. With this progress taking place in physical science Aristotle became suspect, for certain of his ideas regarding physics failed to stand the test of modern criticism. His metaphysics had been used for centuries in support of the doctrines of the Church, and his works concerning the biological sciences had long been the textbooks of the schools. But when the physics of Aristotle had been called into question, chiefly by Galileo, it was unfairly concluded that other parts of his writings were open to criticism. Without justification, therefore, those works shared the fate of the physics, and for the greater part of the seventeenth century his authority suffered an eclipse which did not pass away until the eighteenth century.

Progress can be seen in whatever science is surveyed in the sixteenth century, for the age had arrived when men began to doubt. When this state of healthy scepticism took possession of the mind, inquiry, which must inevitably lead to the increase of knowledge, was the only logical course that could be pursued.

While these changes were taking place in scientific knowledge, a wider and more profound change was shaping itself in the realm of thought. For, towards the end of the century, Bacon was striving to exorcise from the minds of men the four idols, and was building up that system founded on inductive methods which he was persuaded would guide the intellect to just conclusions. The great philosopher, spurning the useless methods which produced no increase of knowledge, fashioned his system with the single aim of gathering the fruit of intellectual effort for the benefit of mankind. Although we can point to no signal achievement as the result of that system, yet it marks the definite severance from the ancient, and the beginning of modern thought.

The Objective Study of Anatomy.

But of all the sciences which showed a tendency to advance in the sixteenth century, that of anatomy claims our attention in an especial manner, for through the advance of that science lay the road to Harvey's great discovery. Anatomy, like the other sciences, had remained dormant until 1543, when a book appeared which exercised the most profound influence upon the subject. I refer, of course, to the *De Humani Corporis Fabrica* of Vesalius, a book from the appearance of which we may date the modern science of anatomy. Vesalius had been brought up to regard the teaching of Galen as beyond the sphere of criticism. But he dissected bodies himself. He used his eyes and found that what he saw was plainly at variance with the account given by Galen and sanctioned by immemorial authority. His mind was torn by conflicting emotions. In his day it required no little courage to impugn so sacred an authority, but eventually he was able to emancipate himself from the old dogmas. He described the human frame as he knew it from his dissections, and when that had been accomplished the days of the authority of Galen were numbered.

The Beginnings of Physiology.

After the publication of this system of anatomy by Vesalius the anatomists became uneasy in their minds regarding the teaching of the great Galen, but so firmly fixed was his authority that they hardly dared do more than utter a half-articulate murmur of dissent. For the majority Galen had furnished for all time the true explanation of the manner in which the blood circulated and performed its supreme function of maintaining life, and they shrank from giving up that explanation sanctioned by time and authority. But their eyes told them only too plainly that much of that explanation was mere supposition and lacking in scientific proof.

What was the theory of the circulation of the blood, and its consequent rôle in the nutrition of the body, as advanced by Galen? At the risk of repetition it must be stated in order to appreciate the great induction of Harvey. Galen's explanation, which I summarize from an admirable description recently given by Dr. Charles Singer, was as follows: The food taken into the body became converted into chyle in the intestines, and was carried by the portal vein to the liver, where it was changed into blood, becoming there endowed with the essence of all living things, called "natural spirits." The blood thus manufactured and endowed by the liver was then carried by the hepatic vein and the vena cava to the right side of the heart. Here it was purged of its impurities, which found egress by means of the pulmonary artery and lungs to the external air. Then the venous blood thus purified ebbed to and fro in the veins and carried on the functions of nutrition. But a small portion of this venous blood filtered through the septum of the heart by means of invisible pores into the left ventricle, where it came into contact with the external air which had reached that chamber by way of the trachea, the lungs and the pulmonary veins. By this contact with the air and the innate heat of the heart the blood became endowed with a higher form of spirit, termed the "vital spirit," and became arterial blood, which, ebbing and flowing in the arteries in the same way as the venous or crude blood, carried on its higher functions of nutrition. But the arterial blood which flowed to the brain became endowed there with the highest form of essence, known as the "animal spirits," and was distributed to the body by means of the nerves, which were held to be hollow canals.

The main supports, therefore, of the hypothesis of Galen were the liver as the source of the veins and the blood; the communication between the right and left sides of the heart through minute and invisible pores in the septum; the presence of three vitalizing essences

and the absence of any circular movement of the blood propelled by the heart. This system, partly based on anatomy and partly on hypothesis, was accepted by the world for more than a thousand years. It postponed and fettered any advance in physiology, and on biological sciences generally imposed restrictions similar in effect to the theory of phlogiston on chemistry.

After Vesalius had broken the ground, anatomists who had sat at his feet carried forward his work until by degrees most of the supports of the Galenic hypothesis were weakened. Servetus, Columbus, Caesalpinus, and Fabricius contributed to the work of destroying the Galenic theory of circulation, but although they gave indications of the coming light, they all lacked the power to draw the all-supreme conclusion. The complete demonstration of the manner in which the blood circulated and nourished the tissues required the work of a genius, and that genius was William Harvey.

In one short work, in size little more than a tract, he proved by a direct appeal to the phenomena of nature that the teaching of Galen concerning the circulation was wrong. He laid the sure foundation upon which almost the whole of our modern conceptions regarding physiology are based. In the history of scientific thought he takes his place beside Copernicus, Galileo, Newton, Lavoisier, and Darwin. By the intuition of genius he was able to sweep away false ideas and systems grown sacred by lapse of time, and in their place to implant sound views acquired on the journey from scepticism to inquiry. Then the book in which Harvey expounded his theory is a model of close and accurate reasoning. Step by step each position is made secure before a new proposition is demonstrated. The whole is then welded together and the inference drawn. Harvey once remarked with a sneer that Lord Bacon wrote philosophy like a Lord Chancellor, and yet the *De Motu Cordis* is perhaps the most perfect example of the inductive method as enunciated by Lord Bacon's vast intellect. Indeed,

it is hard to believe that Harvey, who knew Bacon well, was not influenced to some extent by that capacious mind.

Harvey, then, established the primacy of the heart as a muscular organ propelling the blood in the action of circulation, and explained how the blood found its way from the right to the left side of the heart. When these important facts were made secure the whole of the physiological doctrine of Galen fell to the ground, and the science of physiology was left free to pursue its logical course. It would be wrong, however, to assume that these revolutionary views found instant acceptance, for it could not be expected that a system that had endured for centuries would cease to exist without a struggle. For a time efforts were made to seek a compromise between the old and the new physiology. Even Harvey could not altogether emancipate himself from the glamour of the great name of Galen, and throughout his work, which was directed to the subversion of the ancient authority, he always treats him with respect. But eventually Harvey's doctrine became supreme, and by the time that he was carried to his grave in 1657, all but an insignificant minority accepted his views without reservation.

It has sometimes been assumed that the advent of Harvey's book at once displaced the whole of the system of Galen, including his medical teaching. This conception of the effect of Harvey's work is far from the truth, for, as a matter of fact, it had but slight influence upon the practice of medicine during the seventeenth century. The reason for this will not be far to seek when it is remembered that modern physiology began with Harvey, and had to make considerable advances before it could be of real assistance to medicine. A long and distinguished line of physiologists, ending with Haller towards the middle of the eighteenth century, had to accomplish their work before physiology was able to come to the aid of practical medicine. The science of chemistry, also, was uncreated, and it was not uutil the end of the

eighteenth century that it was in a position to lend its powerful aid in the study of medicine.

The impetus given to the investigation of the problems of physiological science by the appearance of Harvey's work was truly marvellous. Before his day scarcely any attempt had been made to approach the subject from a rational point of view. But after the advent of the *De Motu Cordis* the progress of physiology was triumphant and steady. When we think of the successful labours of Aselli, the discoverer of the lacteals; of Borelli, who brought to the subject the new physics established by Galileo; of Malpighi, the father of our knowledge of the glands and the tissues; of Glisson, who first enunciated the doctrine of "irritability"; of the work of Willis and Lower, we can only be amazed at the advance made in a short time largely through the inspiration of the work of William Harvey.

This College justly acclaimed Harvey as its brightest ornament, and conferred upon him its most signal honours. His work supplied the incentive to several Fellows who, adopting his methods, contributed in no small degree to the enlargement of the boundaries of scientific knowledge. Among those who followed Harvey's precepts in the period immediately succeeding the appearance of his book I record the names of Francis Glisson, Thomas Wharton, Thomas Willis, Richard Lower, William Croone, Nehemiah Grew, Edward Tyson, and Clopton Havers, all of whom are worthy of mention on this day for the work they accomplished for science. But the teaching of Harvey left the majority cold, and did not exert any considerable influence upon their methods of investigating disease. Throughout the seventeenth century physicians were content to inquire regarding morbid phenomena in their studies, rather than at the bedside, until they were aroused from their speculations by the work of a man who stands pre-eminent in the annals of the College: I refer to Thomas Sydenham.

Sydenham.

Among the successors of Harvey the name of Sydenham finds a distinguished place. But, great as he was, by no exercise of the imagination can he be regarded as being influenced by Harvey's epoch-making work. Nor can he be properly admitted to the circle of men who fashioned the distinctive type of seventeenth-century thought. He stood alone in his glory. Knowledge gained from books he despised. The first-fruits of science garnered so marvellously in the beginning of the century were neglected by him, and even the new teaching of anatomy and physiology found him unresponsive. Indeed, except for a great admiration for the work of Bacon, we can hardly point to a single fact warranting us to link him with the spirit of the age in which he lived. He clung tenaciously to the humoral pathology, and was uninfluenced by all the vast changes taking place around him. He was not a scholar; he had a contempt for science, and yet, in spite of these defects, he has left upon medicine in the seventeenth century an impression that will last as long as mankind requires medical aid.

Sydenham was essentially an innovator. He lived in the seventeenth century, but was not of it, and while others were painfully exploring the road of scientific advancement he, with the Father of Medicine as his only guide, fashioned his own path, and for all time laid the foundation of clinical medicine. He was eminently fitted for the task of introducing new methods with the stern and vigorous Puritan blood in his veins; a real rebel; a fearless iconoclast. He was the first of a long line of distinguished physicians who raised the art of clinical medicine to its highest pitch. This country has always been renowned for its great clinicians, and the position to which they have attained has been due almost entirely to the influence of the teaching of Sydenham. If it should be asked what effect that teaching had upon the art of medicine, the answer would be given correctly by pointing to the work of Heberden, Bright, Addison,

and Watson. His method was scientifically sound, and while others were attempting to make signs and symptoms conform to theory and authority, Sydenham went straight to the bedside to gather facts and make observations. In this he was true to the inductive method : a collector of facts from which to induce general principles.

Puritanism in the seventeenth century produced its Cromwell, the embodiment of relentless energy and resistless brain force ; its Milton, who showed to what heights of grandeur and majesty our own dear language can attain ; and its Bunyan, who, all unlettered as he was, in the simplest and sweetest vernacular penned the finest allegory the world will ever read. To these great productions of Puritanism may we not with justice add the name of Thomas Sydenham, the great Puritan physician, who founded for all time and for all countries the art of clinical medicine.

Conclusion.

Neither time nor the scope of this oration permits us to pursue further the immediate and remote effects of Harvey's work. Enough, I trust, has been said to show the comparative dearth of scientific endeavour before the date of his work, and the stimulus scientific research received on account of its appearance. In common with all other results of genius, attempts have been made to claim for others the honour of priority in promulgating the central ideas contained in Harvey's book ; but they avail nothing. Copernicus was not the originator of the heliocentric theory, and Darwin gave to William Charles Wells the credit of having enunciated first the theory of evolution. But their glory is not diminished by these admissions, for ideas without irresistible proof are often the common property of the human intellect.

I do not propose to detain you with a consideration of the work of Harvey concerning generation, for that subject was dealt with last year in a most able and exhaustive manner by Dr. Herbert Spencer, who brought

to his oration the accumulated study and experience of an expert. But there remains Harvey's character as a man, and that is a subject upon which it is good for us to dwell. He lived in an age when men, on account of the state of political and religious feeling, were unusually prone to make enemies, but all that has come down to us regarding his character does infinite credit to the rectitude of his conduct in all the relations of private life. He seemed to be uninfluenced by the strife going on around him, and although attached to the Royalist cause by service and interest, he was able to survey the shipwreck of that cause with fortitude and equanimity. His lofty mental stature rendered it impossible for him to stoop to vulgar polemical disputes, and whenever he was obliged to enter the lists in vindication of his scientific views, it was always with dignity and forbearance. The real character of Harvey is admirably portrayed by Sir George Ent in his well-known account of his visit to him in his old age, when he found him forgetting the lacerations of the mind in the pure joy of searching and studying out the secrets of nature by experiment. Kings might lose their heads, and old orders might be subverted for a season, but Harvey's gaze was fixed upon the beacon of eternal truth. His devotion to this College was an outstanding feature of his life. As its most distinguished Fellow he had conferred upon it the highest honour, and in a practical manner he exhibited his deep regard by his benefactions. His solicitude for the welfare of this noble library found expression in the erection of a building, a gift of books, and a bequest of money. A few years after his death the whole of the library, with the exception of 140 volumes, was destroyed in the Great Fire, but that disaster proved to be our richest gain, for it produced the great bequest of the Marquess of Dorchester, to which we owe the rarity and value of our library. No doubt the liberality of the marquess was in part actuated by the injunction of Harvey to emulate those who had benefited the College, and in our

day the bequest of Dr. Lloyd Roberts, second only to that of Lord Dorchester, was surely due to the same spirit. This library, raised up and maintained by the spirit of Harvey, is the noblest monument we possess of that wide intellectual culture with which this College has always been prominently identified.

Harvey, then, in his life and work is the shining example to this College, and the injunctions he has laid upon us in his bequest in 1656 may be followed safely by all who desire its welfare. In these modern days, when we stand at the threshold of momentous changes, we may still look for guidance and inspiration from those injunctions, for they aptly express our duty as physicians, as men, and as Fellows of this ancient and honourable College.

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